

What is claimed is:

1. A plate-type heat exchanger, comprising:
 - (a) a plurality of parallel plates spaced apart from one another thereby forming alternating first and second passageways for a first gas stream and a second gas stream to pass therethrough, respectively, said plates comprising an ionomer membrane having four sides;
 - (b) means for spacing apart said parallel plates from one another;
 - (c) means for sealing two opposing sides of said first passageways thereby allowing the first gas stream to pass therethrough in a first direction; and
 - (d) means for sealing two opposing sides of said second passageways thereby allowing the second gas stream to pass therethrough in a second direction.
2. The plate-type heat exchanger of claim 1 wherein said ionomer membrane is a sulfonated polymer membrane.
3. The plate-type heat exchanger of claim 2 wherein said sulfonated polymer membrane comprises a perfluorinated backbone chemical structure.
4. The plate-type heat exchanger of claim 2 wherein said sulfonated polymer membrane comprises a hydrocarbon backbone chemical structure.
5. The plate-type heat exchanger of claim 1 wherein said ionomer membrane is a carboxylated polymer membrane.
6. The plate-type heat exchanger of claim 1 wherein said spacing apart means and said sealing means for said first passageway are the same.
7. The plate-type heat exchanger of claim 6 wherein said spacing apart means and said sealing means for said first passageway is a continuous corrugated sheet interposed between said parallel plates that form said first passageway.

8. The plate-type heat exchanger of claim 1 wherein said spacing apart means and said sealing means for said second passageway are the same.

9. The plate-type heat exchanger of claim 8 wherein said spacing apart means and said sealing means for said second passageway is a continuous corrugated sheet interposed between said parallel plates that form said second passageway.

10. The plate-type heat exchanger of claim 1 wherein said sealing means for said first passageways comprise two spacer bars affixed to opposing sides of said parallel plates that form said first passageway.

11. The plate-type heat exchanger of claim 1 wherein said sealing means for said second passageways comprise two spacer bars affixed to opposing sides of said parallel plates that form said second passageway.

12. The plate-type heat exchanger of claim 11 wherein said sealing means for said first passageways comprise two additional spacer bars affixed to opposing sides of said parallel plates that form said first passageways, wherein said additional spacer bars for sealing said first passageways are perpendicular to said spacer bars for sealing said second passageways.

13. The plate-type heat exchanger of claim 11 wherein said sealing means for said first passageways comprise two additional spacer bars affixed to opposing sides of said parallel plates that form said first passageways, wherein said additional spacer bars for sealing said first passageways are parallel to said spacer bars for sealing said second passageways.

14. The plate-type heat exchanger of claim 1 wherein said sealing means for said first passageways comprises creating flanges on opposing sides of said parallel plates that overlap and form said first passageway.
15. The plate-type heat exchanger of claim 1 wherein said sealing means for said second passageways comprises creating flanges on opposing sides of said parallel plates that overlap and form said second passageway.
16. The plate-type heat exchanger of claim 1 wherein said spacing apart means comprises two spacer bars affixed to opposing sides of said parallel plates.
17. The plate-type heat exchanger of claim 1 wherein said spacing apart means comprises a corrugated lattice structural sheet.
18. The plate-type heat exchanger of claim 1 wherein said parallel plates further comprise a webbed sheet adjacent said ionomer membranes.
19. The plate-type heat exchanger of claim 1 wherein said parallel plates further comprise said ionomer membranes interposed between two webbed sheet.
20. The plate-type heat exchanger of claim 1 wherein said parallel plates further comprise a webbed sheet embedded within said ionomer membranes.
21. The plate-type heat exchanger of claim 1 wherein said parallel plates further comprise a sheet of polytetrafluoroethylene adjacent one side of said ionomer membranes.
22. The plate-type heat exchanger of claim 21 wherein said parallel plates further comprise an other sheet of polytetrafluoroethylene adjacent an other side of said ionomer membranes.

23. A plate-type heat exchanger, comprising:

- (a) a plurality of parallel ionomer membranes spaced apart from one another thereby forming alternating first and second passageways for a first gas stream and a second gas stream to pass therethrough, respectively, each of said ionomer membranes having four sides;
- (b) means for spacing apart said parallel ionomer membranes from one another;
- (c) means for sealing two opposing sides of said first passageways thereby allowing the first gas stream to pass therethrough in a first direction; and
- (d) means for sealing two opposing sides of said first passageways thereby allowing the second gas stream to pass therethrough in a second direction.

24. The plate-type heat exchanger of claim 23 wherein said ionomer membrane is a sulfonated polymer membrane.

25. The plate-type heat exchanger of claim 23 wherein said ionomer membrane is a carboxylated polymer membrane.

26. A plate-type heat exchanger, comprising:

- (a) a plurality of parallel plates spaced apart from one another thereby forming alternating first and second passageways for a first gas stream and a second gas stream to pass therethrough, respectively, said plates comprising an ionomer membrane having four sides;
- (b) a corrugated lattice structural sheet interposed between said parallel plates, thereby spacing apart said parallel plates from one another,
- (c) means for sealing two opposing sides of said first passageways thereby allowing the first gas stream to pass therethrough in a first direction; and
- (d) means for sealing two opposing sides of said second passageways thereby allowing the second gas stream to pass therethrough in a second direction.

27. The plate-type heat exchanger of claim 26 wherein said plates further comprise a planar lattice sheet adjacent said ionomer membrane.

28. The plate-type heat exchanger of claim 26 wherein said corrugated lattice structural sheet comprises cross members that intersect at vertices and wherein said planar lattice sheet comprises segments that intersect at intersection points and wherein said vertices of said corrugated lattice structural sheet and said intersection points of said planar lattice plate align.

29. The plate-type heat exchanger of claim 26 wherein said plates further comprise two planar lattice sheets adjacent both sides of said ionomer membrane.

30. The plate-type heat exchanger of claim 29 wherein said corrugated lattice structural sheet comprises cross members that intersect at vertices and wherein said planar lattice sheet comprises segments that intersect at intersection points and wherein said vertices of said corrugated lattice structural sheet and said intersection points of said planar lattice plate align.

31. The plate-type heat exchanger of claim 26 wherein said ionomer membrane is a sulfonated polymer membrane.

32. The plate-type heat exchanger of claim 26 wherein said ionomer membrane is a carboxylated polymer membrane.

33. A plate-type heat exchanger, comprising:
(a) a plurality of parallel plates spaced apart from one another thereby forming alternating first and second passageways for a first gas stream and a second gas stream to pass therethrough, respectively, said plates comprising an ionomer membrane having four sides;

- (b) a layer of webbed netting interposed between said parallel plates, thereby spacing apart said parallel plates from one another;
- (c) means for sealing two opposing sides of said first passageways thereby allowing the first gas stream to pass therethrough in a first direction; and
- (d) means for sealing two opposing sides of said first passageways thereby allowing the second gas stream to pass therethrough in a second direction.

34. The plate-type heat exchanger of claim 33 wherein said webbed netting comprises nodes having a diameter equal to the height of the first and second passageway.

35. The plate-type heat exchanger of claim 33 wherein said ionomer membrane is a sulfonated polymer membrane.

36. The plate-type heat exchanger of claim 33 wherein said ionomer membrane is a carboxylated polymer membrane.